Exotic Plant Management in Sitka National Historical Park

Sitka, Alaska

Summer 2009 Field Season Report

Figure 1- ***Bucket O' Buttercups Contest***

First Annual Sitka Family Weed Pull 2009 volunteer at the

Sitka National Historical Park visitor center

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Abstract

For the sixth consecutive year, the Exotic Plant Management Team (EPMT) worked in Sitka National Historical Park (SITK) to document the distribution and percent cover of non-native plant species and to control these species. In 2009, the focus of effort in SITK continued the 2008 goals of control work and inventory with the help of community volunteers and park staff. Within the ___ acres of the park surveyed in 2009, total count of non-native species observed remained the same: 30 with **the eradication of two species: Perennial cornflower (*Centaurea montana*) and Snow-in-Summer *(Cerastium tomentosum)* from the park**. Creeping buttercup (*Ranunculus repens L.*) was still the most widespread species throughout the park in both sunny and shaded areas, which makes its control a management priority since it continues to aggressively displace native herbaceous species. European mountain ash *(Sorbus aucuparia)* continues to spread within SITK, propagating along edge habitats, including roads, shoreline, riverbanks, and trails. SITK is the only Alaska Region NPS unit with Japanese knotweed *(Polygonum cuspidatum),* an extremely aggressive species. As of August 5, 2009, there were 13 small (<5 inch high) seedlings removed in or near the two locations in which they've been monitored the past five years. Through persistent removal by Geoffrey Smith (SITK Biologist) and the EPMT team over many years, this species seems to be under control. This summer, there were no seedlings observed along the east bank of the Indian River, near these two aforementioned locations. With the assistance of community volunteers and SITK staff, 30 person-hours (3hrs/day for 1 day w/10 people) were spent during the EMPT 1st Annual Sitka Family Weed Pull on Saturday, June 27, 2009 to control *Ranunculus repens L*. along the coastline near the visitor center. During this focused effort, more than 83 kg (183 lbs) of creeping buttercup was removed. Additional control work was performed in SITK through early August by park staff contributing ____ hours to produce _____kg (____lbs) of eradicated creeping buttercup. Because of their small infestations, perennial cornflower (*Centaurea montana*) was again removed from the Merrill Rock area and this year, was dug out even deeper. 89 curled dock (*Rumex crispis*) plants were removed from the courtyard behind the visitor center but other populations in the park no doubt remain. The population of common sheep sorrel *(Rumex acetosella)* increased along the Indian River east bank but was manually controlled this year. European mountain-ash (*Sorbus aucuparia)* seedlings were manually controlled whenever and wherever possible but the coastal berm and visitor center coastline need to be monitored more closely and earlier in the spring due to the tall weeds later in the summer. In subsequent years, monitoring should be continued to determine rate of spread of species already present, the effectiveness of control efforts, and whether new species are colonizing. Control work should continue to focus on removing small, disjunct infestations, populations in areas less disturbed by human activity, along primary human travel corridors where humans and pets will likely spread seeds and along the Indian River banks. While volunteers and staff continue active eradication of invasive plants in view of visitors on park trails, education through impromptu interpretation decreased until park staff joined in the buttercup eradication towards mid-July. Absent was a

valuable work crew SITK had utilized in previous summers, thus less interaction with the public overall. Concentration was on mapping and controlling invasive plants whenever possible. In the future, visitor center park staff (interpretation, maintenance and resource management) should be brought 'on board' earlier if possible to assist with education of the public and physical eradication of specific invasive plants. From mid-June through early August, temperatures remained higher than normal. Rain was practically non-existent, which might have been a factor in keeping invasive plants at a more manageable level than previous years. In general, plants bloomed and seeded earlier than usual, throughout the park. This was the first year that there was a noticeable difference in creeping buttercup populations along some of the trails!

Introduction

Sitka National Historical Park is located on Baranof Island in Alaska's panhandle. No roads reach Sitka from the mainland. Visitors arrive by cruise ship, Alaska State Ferry, chartered plane or regularly scheduled flights from Anchorage and Seattle. Alaska's oldest federally designated park contains over 2 miles of designated trails and numerous undesignated trails. It is the smallest (113 acres) of Alaska National Parks. The trail system can be accessed from many points, with Sawmill Creek road being the easiest foot trails (designated/undesignated) since it borders the park. Summer brings high visitation (2008: 241,407 visitors). Visitors from all over the world walk the trails, unintentionally bringing the potential of global invasive plants to this area. Year round, people will jog, fish, pick berries, walk children and dogs, bike and/or walk their bikes, and push baby strollers on these well used trails. Maintenance staff drives park vehicles on the trails to access areas in need of repair such as the visitor center. It is bordered on the east by a trailer court, Sitka Sound on the south and on the west/northwest by Sheldon Jackson College which closed its doors in 2007. The Indian River runs through the park north to south towards the ocean. Wildlife such as mink, brown bear, black-tailed deer and bald eagles frequent the area as well as domestic dogs and cats. Since 2001, baseline surveys for non-native plant species have been carried out on National Park Service (NPS) lands in Alaska. These surveys provide the baseline data used in formulating long-term monitoring and control plans for exotic plant species in Alaska's NPS units. This season plants assigned an invasiveness rank of 50 or higher in the **Alaska Natural Heritage Program database** were the primary focus of work**.** Work with lower ranking plants was at the discretion of the Biological Technician. Plant rankings are noted in parenthesis after the first mention of a species and again after the plant name in the **"**Plant Synopses and Recommendations**" section.** More information about the Natural Heritage Program is available at http://akweeds.uaa.alaska.edu/. Exotic plant species are a concern to resource managers because they threaten the genetic integrity of native flora through hybridization (D'Antonio et. al 2001), can out-compete resident plant species for limited resources, and can change the structure and function of ecosystems through alternations of geochemical and geophysical processes (Ruesnik et. al 1995, Gordon 1998). Already, 1.1 million ha (2.6 million acres) or over 3% of the 34 million ha (83 million acres) managed by the NPS nationwide are infested with non-native plant

and animal species (Drees 2004). Conservative estimates of the economic costs of biotic invasions are $137 billion in the United States annually (Pimental et, al 2004).

In Alaska, NPS lands have thus far avoided invasion by many pernicious exotic species found in the lower 48 states (Westbrooks 1998). Several factors have contributed to this. The first is climate. Circumboreal flora is adapted to a wide range of climatic conditions that exotic plants cannot tolerate. In addition, many parklands in Alaska have remained relatively free of anthropogenic disturbances, such as livestock grazing, wildfire suppression, and altered hydrological regimes that encourage the introduction of exotic species, thus parks in Alaska still retain all of their major floral and faunal ecosystem components (Densmore et. al 2001). Despite these protective factors, the threat of exotic plant invasion is increasing due to factors including global warming, increases in construction-related disturbance, and tourism. Throughout Alaska over 170 non-native plant species have been documented, accounting for approximately 10% of the flora (Carlson et al. 2005). Fortunately, the NPS has the opportunity to stay ahead of exotic plant introductions in Alaska before they become a problem, but research and active management must begin now (Spencer 2001).

Sitka National Historical Park (SITK) is unique among Alaska NPS units in its very small size and urban setting, being surrounded by the city of Sitka. Exotic plant introductions are encouraged by the influx of summer visitors, the escape of planted ornamentals from Sitka lawns and gardens, and ongoing park maintenance and construction, which create new areas of disturbances that can facilitate the establishment of exotic species. Fortunately, the park's small size makes it relatively easy to monitor and control incoming plant species, but park managers must remain vigilant. EPMT work has occurred in SITK annually since 2004. Unlike 2004 and 2005 efforts that primarily focused on inventorying the park, the purpose of the 2006, 2007 and 2008 efforts in SITK were to… 1) re-treat creeping buttercup along the trails between the footbridge and the outhouse; 2) control dandelions along the shoreline; 3) monitor the areas surveyed in 2004-8 to detect changes; and 4) look for invasive species new to the park. **In 2009,** efforts in SITK were to: 1) complete the park mapping, monitoring and inventory process; 2) a more thorough monitoring of Japanese knotweed (along Indian River banks and a greater perimeter around the two sites already being monitored); 3) monitor and control more closely, the coastal berm, visitor center area and trail edges for European mountain ash; 4) re-treat creeping buttercup along trails between the footbridge and the outhouse, as well as those trails that extend out from this heavily used area; 4) look for invasive species new (or returning) to the park. Information on the status and number of exotic plant species in SITK will be used to help prioritize areas in the park and state for long-term monitoring and control of these species on Alaska NPS lands.

Methods and Materials

EPMT fieldwork at Sitka National Historical Park occurred intermittently from June 8 through August __, 2009 following the 2009 Alaska EPMT data collection protocol. Areas monitored

included the most frequently used trails, the maintenance and visitor center area, the coastline and part of the east banks of the Indian River. Unlike 2006 - 2008, less time was spent controlling invasive species in 2009 than in previous years due to staff shortages and lack of availability of a work crew to assist and attack the most infested areas. Efforts were more focused near the visitor center area, walking trails and coastline. The 1st Annual Sitka Family Weed Pull concentrated on reducing creeping buttercup along the coastline nearest the visitor center on Saturday, June 27, 2009.

Figures 2- 3: Volunteers eradicating creeping buttercup near the park visitor center coastline.

A Trimble Pro XRS with a Ranger datalogger was used for all data collection during monitoring and control events. Equipped with the Alaska EPMT standardized data dictionary (Table 1), the Pro XRS can achieve sub-meter accuracy and ensure data integrity. Areas with and without non-native species were inventoried at a resolution to allow inter-annual comparisons of plant distributions. The data dictionary provides sufficient detail for describing the size, diversity, and severity of exotic plant infestations and for population of two distinct databases: APCAM (Alien Plant Control and Monitoring - a nationwide NPS database for exotic plant data) and AKEPIC (Alaska Exotic Plant Information Clearinghouse - a collaborative, interagency, web-based database for tracking Alaska weeds).

Figure 4 Below: Also called creeping crowfoot, all fibrous branches from the roots of creeping buttercup (*Ranunculus repens L*) must be tracked down and removed.

Table 1. Fields used in GPS data dictionary and GIS shapefile for exotic plant surveys, summer 2009.

Location Name	Location ID (sitka nps, sitka outside nps)
Disturbance Type	Because most of Alaska's exotic plants grown only on disturbed sites, we are tracking what disturbance types are being invaded by what species in NPS units. Disturbance Type (fill importation, material extraction, coastal, stream, river, glacier, trampling, wind throw, slide, animal, ORV disturbance, mowing, wildfire, logging, mining, grazing, plowing, brush cutting, herbicide, wind, thermal, volcano, abandoned homesite, or other)..
Site Description	Description of location, including remoteness, proximity to water, etc.
Buffer Distance M	Buffer distance (in meters) to convert points and lines to polygons.
Taxon	This is the dominant exotic plant species of a particular infestation. All species that have been reported from Alaska NPS units are on this list. "Other" is used for species either unidentified OR not previously recorded with a description in the Remarks field. If the mapped area is free of exotic plants, "None" is used. Species ranked greater than 50 need to be recorded precisely rather than as part of another species' infestation.
Phenology	The dominant phenology of exotic species (rosette, no flower, full flower, in seed, stand dead, or none). If monitoring a location for a species and it's not redetected, put the name of the species being searched for in Taxon and select 'not detected' in this category to better track eradications.
%_Cover	Cover class percentage of dominant exotic species. (0, 1, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 100) Accurately record extent & density!
Stem Count	The stem count of the dominant species. A blank field indicates the number of plants was not counted. Zero should be used if there are no plants, only.

Action	"Inventory" is the first documentation of a particular infestation, whereas "Monitor" is a follow-up visit to a previously inventoried site from this year or previous years. "Treatment" is the first control effort for a particular infestation and "Retreatment" applies to any subsequent control efforts in either the same or successive years. "Manual" involves pulling or digging. "Mechanical" involves actions like mowing, weed-whacking, chain-sawing, etc. "Chemical" involves the use of herbicides.
% Treated	Percentage of area treated -0, 1-25%, 26-50%, 51-75%, 76-95%, 95-100%. Complete comments section.
Cntrol_per_hrs	Default: -9(no data). # of people x hrs spent controlling. (for 1st taxon only)
CntrolEffrt	Projected/actual control effort (low<1 hour, medium 1-8 hours for one person, high>8 hours for multiple people or multiply days to control.
Is Exhaustive	"Yes" if all the exotic plants encountered were recorded. "No" if only a subset of species are recorded.
Comments	Any additional remarks. Detailed comments such as where to look, possible source of infestation, etc.
Park Unit	Associated park (SITK)
Is Inside Park	"Yes" if the area mapped is located on park land. "No" if it lies outside of the park boundary or on inholdings.
Recorder Name	Recorder (KLL = Kristi Link)
Team Name	AKEPMT = Alaska Exotic Plant Management Team. Use 'Other' if volunteer or other park *staff*.
Taxon, 3Taxon... 2Phenology, 3Phenolgy... 2%_Cover, 3%_Cover... 2StemCount, 3StemCount... 2Action, 3Action... 2Control_Effort, 3Control_Effort...	Additional fields for 9 other exotic species for each unique site including fields for Phenology, Percent Cover, Stem Count, Action, and Control Effort.

The data collected using the GPS was differentially corrected using the closest base station (usually CORS, Level Island, Gustavus (GUS2), AK) or Biorka Island and edited in Pathfinder Office (version 4.10), using the software TerraSync (TS) v3.30 from Trimble. The corrected files were exported as shapefiles for use in ArcGIS (ESRI, version 9.1). The permanent dataset is a multiyear, multipark geodatabase maintained by the Alaska Region EMPT.

Results and Discussion

Following the intensive inventory efforts of 2004 and 2005, a relatively cursory inventory of SITK was conducted in 2006, 2007, 2008 and 2009 to rapidly assess the park for new species or expansion of existing species. Within the relatively small subsection of the park (____acres) monitored, no new species were observed but two species previously observed in earlier years was discovered and partially removed: birdseye pearlwort (*Sagina procumbens*) and curled dock (*Rumex crispus*) from the visitor center area. Two other species, Snow-in-Summer (*Cerastium tomentosum)* and Perennial cornflower *(Centaurea montanar)* were eradicated from the park, located just a few feet from the northwest boundary, along Lincoln Street.

That most visible of invasive species, Perennial cornflower (*Certaurea montana)* was again found blooming near the visitor center and near Merrill Rock. After being dug out by hand in 2008, it was again dug out by hand to a deeper level more extensively this summer, producing approximately 50 pounds of plants, dirt and roots. Most of the species identified from previous years were relocated in similar locations but slightly increased distributions. Since 2004, a total of ___ ha (acres) of the park has been inventoried.

The majority of the 2009 EMPT summer was spent inventorying new areas (mid-park, off trail), re-monitoring and remapping the park area with the Trimble unit for changes in distribution, controlling exotic species and lastly, informing visitors about the EPMT program and invasive plants. The primary control area during the First Annual Sitka Family Weed Pull was the shoreline just out of view of the visitor center with over 183 pounds of creeping buttercup collected. All sites were selected based on the high density of species and the lower likelihood of control activities trampling desired native vegetation. The two intertidal meadows were not worked on in this past summer due to time constraints and lack of staff. All dandelion plants had already gone to seed by mid-June on the south beach area so no 'beheading' of dandelions occurred in this area in 2008 or 2009. This is an area that needs to be constantly monitored earlier in the spring with control measures beginning as early as possible. All visible Japanese knotweed plants near the bridge (two sites) were removed. The spread of this plant increased and more seedlings were removed this summer (13 seedlings). The 2007 concerted effort to eradicate large patches of white clover around some of the totem poles near the shore was still noticeably absent of white clover but in other areas of the park, large populations were in bloom by mid-July. Other exotic species were removed opportunistically during the monitoring and control work. Kristi Link worked through August 5th to continue to map, monitor and control exotic plants throughout SITK. The interpretative staff worked to control exotic plants through _____.

Non-native species previously identified within SITK that were **not relocated** in 2008 or 2009 included black bindweed, shephard's purse, yellow toadflax and lambsquarters. Annual bluegrass, Kentucky bluegrass, common timothy, reed canarygrass, and an unspecified dock were observed this year mostly on the eastern boundary/sidewalk area next to Sawmill Cove.

Most of these species are likely still present within or near SITK; however, due to the time of year and field staffing, they were not documented in 2008 or 2009. For instance, the bluegrasses are still the dominant grass species in lawn areas of SITK; however, effort was not made to document them in 2009: construction around the visitor center area limited some of the monitoring this year. Bird's-eye pearlwort *(Sagina procumbens)* was found and removed near the visitor center, in the courtyard behind the visitor center, and near Merrill Rock. Appendix B shows the locations of most of the non-native species observed since 2005. The shapefile generated from the field inventory may be used in GIS to access additional information, including the assessment of invasive plant densities and the estimated control effort needed to eradicate these infestations.

During the first 8 weeks of a warmer summer in SITK while monitoring/mapping and controlling invasive plants, there was a decrease in the number of visitors from cruise ships on the trails, overall.

Species Summaries

The lack of identifying any new exotic species within SITK this year may have been due to the focus on the eradication of the two most invasive species (creeping buttercup and Japanese knotweed) and the warm dry summer through early August. Just because new species were not noted in 2008 and 2009 doesn't mean they aren't there. Continued and consistent monitoring, mapping and control to protect the native plant communities are still urgent priorities. In the open areas, including mowed lawns, common dandelions, white clover, common plantain, creeping buttercup and mouse-ear chickweed are ubiquitous. In shadier wooded areas along many of the trails, creeping buttercup seemed to be less visible but European mountain ash continue to prevail in the coastal berms on the ocean side (west/southwest). Since there has been minimal control done on the east park boundary, adjacent to Sawmill Creek road, new invasive plants are likely to appear and be noted in the park soon. In mid-July, after park staff began assisting with buttercup eradication, more time was spent observing problem areas for invasive plants seen pre-2009. Two were found in increasing but isolated populations: bird's eye pearlwort (*Sagina procumbens)* and curled dock (*Rumex crispis*) as discussed earlier in this report.

Perennial Cornflower - *Centaurea montana*

In 2008 and now 2009, more patches of blooming perennial cornflower, an escaped ornamental species, was found growing along the sidewalk of Lincoln Street and down into the understory towards Merrill Rock. This species is persistent and continues to spread vegetatively rather than by seed. Control might still be possible but labor intensive if continued each year. Plant clumps and all roots have to be dug out by hand each year as has been done in the last two years. Less than 20' away, across the street are healthy specimens of a minimum of 6 invasive plants that are not being controlled by the owners which will be a constant seed source if nothing is done.

Mouse-ear Chickweed – *Cerastium fontanum*

C. fontanum is prevalent outside the park and in open areas within the park. It is a small inconspicuous plant that needs sufficient light in disturbed areas or along the coast or tucked into old logs and on the sides of trails intermittently. Controlling this species would be time consuming but would produce results and would be worth the effort in 2009 since it has yet to invade other habitats. The historic battle site area has a large but dispersed population and should be monitored and controlled whenever possible. The Park garden areas near and around the visitor center need to be monitored: populations of this plant have increased since 2008.

Snow-in- Summer – *Cerastium tomentosum*

In 2006, this species was first identified growing in the rocks separating the shoreline and the sidewalk of Lincoln Street and continued to spread vegetatively but not by seed. There was time in this season to control this species. This is the only known area this species had been observed. There are numerous invasive garden plants directly across the street from this area, one of which is *Cerastium tomentosum so constant monitoring of this area is vital.*

Foxglove - *Digitalis purpurea*

Foxglove is a popular garden ornamental that continues to spread and thrive throughout Sitka. This year there were a few seedlings observed and removed within the Totem Park portion of SITK so this should continue to be monitored as seedlings persist for more than five years (personal experience). They are easily identified and removed thus it is feasible to control this species on an annual basis. The area surrounding the Russian Monument, the parking lot areas (both sides), park gardens, courtyard behind the visitor center and the east boundary bordering Sawmill Creek Road should be monitored closely at the beginning and end of the summer.

Oxeye Daisy - *Leucanthemum vulgare* This species was not inventoried nor controlled in 2006 because it was too early in the season for flowers to appear. In 2007, many seedlings were removed and those in full bloom were easily controlled. In 2008, the cool late spring prevented maximum control except in the most obvious sites such as Merrill Rock and in scattered sites throughout the park. In 2009, many seedlings were removed from the park garden plots in front of the visitor center and the courtyard behind the visitor center, but most likely, not all seed sources were removed. *L. vulgare* is very common outside the park boundary; in fact it's a species preferred by many Sitkans. Most of the people I talked with were unaware that this species is the carrier of viruses that easily spread to other garden plants. Continued education and monitoring is necessary to ensure the species does not become established in other locations.

Yellow Toadflax - *Linaria vulgaris*

Yellow Toadflax (also referred to as butter and eggs) was found outside the park in 2006 (not in 2007, 2008 or 2009) in a parking lot of Sheldon Jackson College. It should continue to be monitored in this area even though the college has closed; there are still people living in this area. It was not found this year and is a species not likely to spread into the adjoining parkland since the dense, shade-producing canopy will preclude its establishment but seeds could be transported by people or animals to habitats with more available light. Once established, this species is very difficult to remove.

Unidentified *Lychnis/Silene*

Although not positively identified in 2005, this plant with a white flower and silver foliage is likely a garden escapee since there are multiple other garden cultivars growing along the roadside near Merrill Rock. Upon positive identification, this species should be removed.

Apple - *Malus pumila*

A domestic apple tree is still growing near the WWII bunkers in the vicinity of the Fort Site. Tree ring analysis suggests the tree to be from around WWII (Griffen pers. comm.). In the area are other *Malus* trees that appeared more likely to be native crabapples. None of the trees are thriving in their understory habitats, and the effect to the native ecosystem seems minor. Since the apple tree may serve as a valuable cultural link to WWII, it is recommended that the tree be allowed to continue to grow at this time.

Pineapple Weed – *Matricaria discoidea*

This species was previously identified around the Visitor Center in earlier years. It was removed from this area again this year and is found in small pockets throughout the parking lots and along the eastern boundary of the park. In 2007, it was discovered in the upper Visitor Center parking lot and near the Russian Memorial (small distribution). In 2009, this species was observed but in small populations. It should be monitored closely in future years. The Alaska Natural Heritage program has ranked many non-native species based on the species' observed threat to invade native communities and the subsequent difficulty of their removal. The scale is from 1-100 with a higher number indicating a greater threat. Combining pineapple weeds' relatively low ranking (33 – Appendix A) and its limited distribution, the threat of this species to the native flora of SITK is low.

Forget-Me-Not – *Myosotis scorpiodes*

Although the forget-me-not (*M. alpestris ssp. asiatica)* is Alaska's state flower, it is rare to find it growing naturally in Southeast Alaska. In contrast, a European forget-me- not *(M. scorpioides)* is prevalent and frequently planted. It is also possible that the native population of the European species of forget-me-not was found and removed in 2006 growing near the Russian Memorial. No populations of the blue, pink, and white flowering forget-me-nots were removed in the Merrill Rock area in 2009.

Reed Canarygrass – *Phalaris arundinacea*

Sawmill Creek Road is the only known location of *P. arundinacea* but it has great potential to spread and displace native species (Ranking 83 – Appendix A), particularly in riparian habitats. Annual monitoring of the species should continue throughout SITK. If this plant is detected, the entire plant with root system needs to be removed since regrowth from rhizomes is probable.

Common Timothy – *Phleum pretense* This plant is currently restricted in its distribution to areas outside the park since the removal of a small population in 2005 from the Totem trail. Since it is common along the Sawmill Creek Road sidewalk, it is possible that seeds will be transported into the park by animals or people, thus annual monitoring should continue. Monitoring should begin earlier in the year, before that area becomes overgrown and a late summer follow-up monitoring is suggested.

Common Plantain – *Plantago major*

P. major does well in highly disturbed habitats and rarely spreads into less-disturbed areas. Removal is relatively easy making it possible to remove the smaller populations such as along the Indian River and near the bench on the Totem Trail. Very little control of this species was done in 2007, 2008 and 2009. It is noticeably present in the lawns of the main visitor center and seems to be spreading.

Japanese Knotweed – *Polygonum cuspidatum*

Removal of this persistent species has occurred since 2001 yet it continues to re-sprout from the same two locations it has been 'removed'. Previous removal of it has reduced the vigor of these populations, both near the footbridge. The park biologist, Geoffrey Smith has continued to remove shoots since 2005. With continued monitoring and removal, this highly aggressive species (Ranking 87 – Appendix A) will likely remain under control and eventually the energy reserves in the root system will be depleted and the species could be eradicated. Since at least 2006, there have been two strong populations of this plant growing across the street (on private property) from the Visitor Center and Merrill Rock area, growing at a phenomenal rate and possibly spreading into the park. Diligent monitoring of this part of the park should continue to be a priority since once this plant gets a hold, it's very difficult to remove. In 2008-9, much time was spent scouting out this species, including some of the Indian River banks. Continued autumn monitoring should occur as well.

Sweet Cherry – *Prunus avium*

One cherry tree is still growing along the beach at the southern tip of the park since its discovery in 2005. The fruits are palatable, and park staff continues to promise to control the fruits annually. The tree should be monitored to determine if seedlings are appearing in the vicinity, however. If the tree does begin to spread, all plants should be removed.

Creeping Buttercup – *Ranunculus repens*

R. repens has the most widespread distribution of all non-native species within the park, including both open and shaded habitats. It is common along trails and in mowed lawn areas and appears capable of displacing the native forest understory herbaceous species, including deer

heart *(Maianthemum dilatatum)*, small-flowered buttercup *(R. uncinatus)*, and large-leaved avens *(Geum macrophyllum)*, in areas without disturbance. Areas with extensive slug herbivory on native species showed relatively little damage of *R. repens*, suggesting this species may be unpalatable or possibly even toxic. Since no habitat in the park seems immune to *R. repens* invasion, this continues to be the priority control species. Recruiting volunteers for control activities in late June to mid-July in normal spring conditions while the plants are in full flower will ensure easier identification and removal. The warmer, dryer early part of the 2009 summer produced creeping buttercup blooms in late June, making identification very easy for the Weed Pull event. In 2006-2009, efforts were focused on removal of this species from the area east of the footbridge, near the battle site and near the shore side of the visitor center. Focus should continue on removal of small blocks of this plant, especially where it's threatening native species. To insure that more of the root system is removed, soil knives or grapefruit knives were used by EPMT staff this year. The park staff joined in the 2009 eradication in mid-July and they worked hard on eradicating this invasive plant. This was the first year that there was an obvious decrease in the population of this plant along some of the most used park trails.

Rugosa Rose – *Rosa rugosa*

Locally referred to as the Sitka rose, this plant is native to China, Japan, and Korea that has been well documented to escape cultivation and efficiently naturalize. The origin of the 'Sitka' rose likely dates back to the establishment in Sitka of the Alaska Agricultural Experimental Station and its first superintendent Charles Georgeson who introduced this species between 1903 -1921 and later sent it to other areas of Alaska for cultivation (Holloway 2006). The 2007 planting of rugosa roses near the Visitor Center is effectively limiting foot traffic on the hills since the plants have thorns. If the plants are maintained and monitored to prevent spreading vegetatively, they are not likely to naturalize.

Common Sheep Sorrel – *Rumex acetosella*

First identified in 2005, sheep sorrel continues to slowly invade the eastern corner of the park from the neighboring Arrowhead Trailer Park. Small patchy populations are now visible in the park gardens around the main visitor center and seems to be moving inland from the shoreline so the distribution can't be considered restricted to the shore's banks anymore. The species can still be controlled at this time if monitored and eradicated each summer. Once it spreads, control will be exponentially more difficult. The entire root mass and all rhizomes should be removed for effective control.

Curly Dock *Rumex crispus*

R. crispus is easily confused with the native western dock *(R. aquaticus).* It should be identified and monitored early in the summer before the grasses on the Sawmill Creek Road sidewalk get too tall to monitor. In 2006, it was found growing along this area, outside the park boundary but was not observed in the 2007-2008-2009 surveys due to tall grasses. Bitter dock *(R. obtusifolius)* was observed in the 2000 exotic plant inventory but has not been observed since then. This is a difficult species to monitor as it interbreeds with other docks; identification can be difficult. Monitoring should begin as early as possible for identification. An excessive population of curled dock was eliminated from the courtyard behind the visitor center this year and should be monitored closely in the future.

Birdseye Pearlwort – *Sagina procumbens*

This species was seen growing in mowed lawn areas near the Visitor Center, Russian Bishop's House and by Arrowhead Trailer Park in 2006, but was not observed in 2007 or 2008. It made a comeback this year in the old picnic area on the west side of the park where the soil is still recovering from past disturbance and was promptly removed. It was completely removed from the visitor center area (in the lower parking lot and the circular walkway in between the upper parking lot and main visitor center) but there are patches of it remaining in the courtyard behind the visitor center. All plants were removed from the maintenance yard above the upper visitor center parking lot earlier in the season. Monitoring in these areas should continue. It's also locally called Irish or Scottish moss and sold as a groundcover in Sitka.

European Mountain Ash – *Sorbus aucuparia.* This species has been planted widely in Sitka in yards and along the roads. This species' prolific production of red berries, which are consumed by birds and redistributed, has resulted in hundreds of mountain-ash trees within SITK ranging from small (< 0.5 m tall) seedlings to trees exceeding ten meters in height. Although *S.*

aucuparia may hybridize with the native *S. sitchensis*, the mountain-ashes in SITK display the characteristics of the non-native species (Table 2). Smaller seedlings are easily pulled from the ground. From 2006-2007, a few seedlings were removed along trails while transiting to other control sites. In 2008-9, closer monitoring in the coastal berm area just east/south of the visitor center produced a few foot high seedlings from mother trees that were removed. These seedlings are growing in a variety of areas: along the shoreline, roadside, riverbanks, coastal berms and trails and around maintenance buildings and the wood carving shed behind the visitor center. The trees seem very tolerant of marginal conditions. For instance, a seedling was growing on a beach log much closer to the salt water than any other woody species, including Sitka alder *(Alnus viridis* spp. *sinuate*), a relatively salt-tolerant native species. Due to their adaptability and ability to displace other species, all seedlings should be removed when located if at all possible. NOTE: Mature European mountain-ash trees are adding structural diversity to the current forest. Many of the mature trees are hosting lichen and moss growth. Trees are likely being used for nesting habitat. Complete removal of all mature trees would create widespread disturbance throughout much of the park, which would increase the likelihood of other non-native plant invasions. In addition, this species is very successful at stump and root sprouting, so cutting trees will likely result in widespread re-growth over many years. Due to these concerns, removal of mature *S. aucuparia* should be performed in stages with experimentation as to how best to kill the tree to eliminate re-growth. The selective use of an herbicide, such as a cambium swipe with Garlon 3A on the recently cut stump, would inhibit re-sprouting. Selective use of herbicides in Alaskan National Parks may be a viable option following the Alaska Region Exotic Plant Management Plan Environmental Assessment that is currently being drafted.

Table 2 - Comparison of traits of native and non-native mountain-ash species (Klinkenberg 2004, Hulten 1968). The hair color appears one of the easiest features to distinguish the two species.

	European Mountain-ash ***Sorbus aucuparia*** **(non-native)**	**Sitka Mountain-ash** ***Sorbus sitchensis*** **(native)**
Height	Small tree, 5-15 m	Medium to tall shrub, 1-4 m
Trunk/Stem	Primarily single stem, grayish, branched	Multi-stem, grayish-red, sparingly branched
Winter buds/young growth	Grayish soft-hairy	Somewhat rusty-hairy
Leaves	11 to 15 (17) leaflets, sharp pointed at the tip, mostly smooth, saw-toothed almost to the base	7-11 leaflets, rounded to blunt at the tip, sometimes rusty-hairy below, coarsely saw-toothed for not more than ¾ their length
Flowers	Flat-topped; branches white-hairy; calyces hairy	Half-rounded; branches rusty-hairy; calyces mostly smooth

Fruits	Globe-shaped; not glaucous	Globe-shaped to ellipsoid; glaucous
Habitat	Cultivated, and escaped	Woods, up into subalpine region

Common Dandelion – *Taraxacum officinale ssp. officinale*

Dandelions are growing in sunny locations, including the mowed lawns near the Visitor Center, Russian Bishop's House, and Fort Site and along the shoreline, riverbanks (inclusive of the tidal meadows), and Sawmill Creek Road. Based on the density of plants and the level of continued disturbance, the focus of dandelion control work should be along the coastline and riverbanks where human disturbance is minimal and native plant community structure is still intact. Areas with extensive human trampling will be more difficult to control over the long term, and the native plant community has already been affected. In 2006, 2007 and 2008, control work at the historic battle site focused on removing dandelions from the coastal margin. In 2006, the effort occurred as the plants were distributing seeds, yet a significant difference was achieved. In 2007, many of the seed heads had been removed in early June to prevent seeding and it was difficult to locate those dandelions in the tall grass that had since grown over the area. It would be invaluable to have volunteers assist in the removal of the entire plant earlier in subsequent years if possible, but if this isn't possible, removing the seedheads seems like the only reasonable solution at this time. Either way, repeat control events will be needed in subsequent years to deplete the seed bank in the soil. In 2008, considerable efforts were directed on the removal of all dandelions in the two intertidal meadows which were not worked on in 2007 but the area was not worked on at all in 2009 due to lack of personnel and time constraints. What was observed in this area this year was the abundance of northern rice root or black lilies (Fritillaria camschatcensis) in greater numbers which may/may not be a direct effect of weeding dandelions in previous years.

Red Clover – *Trifolium pretense*

Thus far, red clover has been observed only outside the park along Sawmill Creek Road. Annual monitoring within SITK, particularly in more open areas, will ensure quick detection and rapid removal of this species. Small patches of red clover may be increasing along the edges of the park.

White Clover – *Trifolium repens*

White clover has successfully invaded many of the sunnier locations within and outside of the park. Due to the creeping nature of this species where it roots at its nodes, controlling it is particularly difficult. Efforts should be made to remove the smaller populations, such as along the shoreline, before they become too widespread. There were some totem pole areas in the park

that were surrounded by incoming white clover, although populations aren't as solid as they were in pre-2007 times because of the concentrated effort to eradicate the plants. Near the parking lot visitor center, close to the Rugosa rose fence, there is a small population that was worked on in 2009 but needs more work as the root system continues to weave through the mosses in that area and it's difficult to get all of the roots. It's a regularly mowed area also.

Progress is being made, however small…..see figures below.

White Clover: June 2007

Same area White clover: July 2009

Other Species

The 2002 vascular plant inventory identified five other non-native species that were not detected again this year because focus was on removal and eradication of the higher ranking invasive plants. Closer observation in future years on the following invasive plants would be wise: *Capsella bursa-pastoris, Chenopodium album, Poa annua, Poa pratensis*, and *Polygonum convolvulus.* According to Rob Lipkin of the Alaska Natural Heritage Program (W. Rapp pers. comm. 2005), shephard's purse was found in the lawn near the visitor's center toward the beach. A single specimen of lambsquarters was found in gravel near the beach at the south end of the park. Identification of lambsquarters to species is now known to be dependent on seed characteristics, so future surveys will need to look for these features. In the lawn at the Fort Site and near the Visitor Center, annual bluegrass was observed. Kentucky bluegrass was seen in three areas: near the southeastern tip of the park south of the mouth of the Indian River on the bank above the riprap; in beach gravels approximately 300 meters southeast of the Visitor Center; and on a log near the mouth of the Indian River. It is likely that the two Poa species were overlooked due to uncertainty in identification. Non-native Poa species, including *P.*

annua and *P. pratensis*, are presumably dominant grasses in open, mowed areas, such as the Fort Site, the Visitor Center lawn, and the Russian Bishop's House lawn. Finally, black bindweed was seen in several forested areas along a trail near the Visitor Center in previous years but could not be found in 2009. Increases effort to find these species in subsequent years is recommended.

Other Thoughts

Considering its' urban setting, extensive foot traffic by humans, bikes and dogs, and ample sources of non-native seeds/plants in outlying areas, SITK thankfully still has many areas that have not yet been affected by non-native species. Reducing anthropogenic disturbance activities, such as trampling and tree removal, will help maintain a vigorously growing native plant community. Social trails should be minimized to reduce disturbance and the potential for introducing new species. Areas where the forest canopy has been compromised such as areas with wind-thrown trees are more susceptible to invasions, so continued monitoring should be maintained and restoration plantings encouraged. The maintained landscape of SITK should be a reflection of the local flora and cultural history of the place. The garden in front of the Russian Bishop's House should reflect the Russian occupation of Sitka, Alaska. If species like foxglove and hollyhocks didn't contribute to the Russian culture, they should not be perpetuated in the park. Near the Visitor Center, the landscape should reflect the natural diversity of native species from Baranof Island. The recent addition of native plants to the landscape in front and back of the Visitor Center is a welcome change but more effort is needed for the area to be maintained.

The city of Sitka has numerous groups, organizations, and agencies where partnerships regarding invasive species should be developed. The gardening community and plant retailers should be educated regarding species of concern and encouraged to plant native species. Vegetation related boards of the City of Sitka should be consulted to work cooperatively. Partnerships with non-profit organizations such as the Sitka Conservation Society, Girl Scouts, Boy Scouts, and local schools may provide valuable volunteer resources. Finally, other state and federal agencies with interests in the greater Sitka area can also offer valuable assistance.

Other Non - Plant Exotic Species

Although no inventory efforts have been made to document other exotic taxa, some incidental observations and conversations have identified some non-native animals. Within Sitka National Historical Park, European starlings *(Sturnus vulgaris)* have been observed near the Visitor Center, feeding in the intertidal zone, and near the mouth of the Indian River. European starlings may be breeding within the park and are displacing native species (Smith pers. comm.. 2006/2007). Red squirrels *(Tamiasciurus hudsonicus)* were introduced to Baranof Island in the 1930's and are now prevalent within the park. During the same time, martens *(Martes americana*) were also introduced to the area; however, it is unknown whether they occupy SITK (Schrader and Hennon 2005). Although not observed within the park, visitors and park staff should be alert for the rough skin newt *(Taricha granulose)* that was accidentally released in

Sitka in fall 2004 and has established in the area (Miller 2005). Domestic cats and dogs free roam the park occasionally (Smith pers. comm. 2006/2007). No effort to determine exotic insects or diseases has been made. An invasive species of snail has been increasing in populations at the Starrigaven area of the National Forest. It is an aggressive black slug that preys on native banana slugs and should be monitored as it is not yet been seen in SITK. No additional information is currently available for other species.

Recommended plans for 2010 field season

Prevention and proactive removal will save time and money in the future with regard to invasive plant issues. Well-trained personnel are essential for monitoring and control efforts. In addition, park projects should use best management practices to avoid introducing or spreading exotic plants. Educational programs for park staff, Sitka residents, and visitors will further develop awareness for the issue. This heightened consciousness will improve recruitment of volunteers for control events. In 2007, there was extensive construction in/on the Sawmill Creek Road and bridge area. In 2008 and 2009, there was much construction work done all around the main park Visitor Center which may provide more opportunity for other invasive plants to enter. These areas should be monitored closely in future years. Because of the number of small seedlings found along the shoreline and the Indian River banks, a more thorough inventory and subsequent control is recommended for 2010. A continued thorough search of Japanese Knotweed *(Polygonum cuspidatum)* is recommended, especially near or on the Indian River banks. Overall, an earlier detection of all invasive plants, before early June if possible, is recommended.

May

- Survey for common dandelion when they are in peak bloom, before seeding has begun. Recruit volunteer crew to remove plants, particularly along shoreline, river edge, and intertidal meadow. If this isn't possible, be-head as many dandelions as possible.
- Provide educational programs to interpretative, resource management, and maintenance staff regarding the threat of invasive species.
- Collect specimens absent from herbarium.

June

- Monitor park to determine distribution of non-native species.
- Remove all European mountain-ash seedlings found.
- Control creeping buttercup.
- Check and control regrowth of Japanese knotweed.
- Provide educational programs for community and visitors.
- Collect specimens absent from herbarium.

July

- Control creeping buttercup, oxeye daisy, foxglove, and other species. Recruit volunteer crew to help with removal.
- Provide educational programs for the community and visitors.
- Collect specimens absent from the herbarium.

August

- Continue controlling all species.
- Collect specimens absent from the herbarium.

September

- Continue controlling all species.
- Complete data processing and report writing.

Collect specimens absent from the herbarium.

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Appendices

Appendix A – List of known invasive plants within/near SITK

Common Name	*Taxon*	*Observed inside park?*	*Source of Observation(a)*	*AK Weeds Ranking(b)*
shepherd's purse	*Capsella bursa-pastoris*	Yes	2	40
perennial cornflower	*Centurea montana*	Yes	4, 5, 6, 7, 8	not ranked
mouse-ear chickweed	*Cerastium fontanum*	Yes	2, 4, 5, 6, 7, 8	36
snow-in-summer	*Cerastium tomentosum*	Yes	5, 6, 7, 8	not ranked
Lambsquarters	*Chenopodium album*	Yes	2	37
Foxglove	*Digitalis purpurea*	Yes	1, 2, 3, 4, 5, 6	51
oxeye daisy	*Leucanthemum vulgare*	Yes	1, 2, 3, 4, 6, 7, 8	61
yellow toadflax	*Linaria vulgaris*	No	4	69
	Lychnis/Silene	Yes	4	not ranked
apple	*Malus pumila*	Yes	4, 5, 6, 7, 8	not ranked
pineapple weed	*Matricaria discoidea*	Yes	2, 3, 4, 6, 8	32
forget-me-not	*Myosotis scorpiodes*	Yes	4, 5, 6, 7, 8	not ranked
Reed canarygrass	*Phalaris arundinacea*	No	4, 8	83
common timothy	*Phleum pretense*	Yes	2, 4, 8	56
common plantain	*Plantago major*	Yes	1, 2, 3, 4, 5, 6, 7, 8	44
annual bluegrass	*Poa annua*	Yes	2, 8	46
Kentucky bluegrass	*Poa pratensis*	Yes	2, 8	52

black bindweed	*Polygonum convolvulus*	Yes	2, 8	50
Japanese knotweed	*Polygonum cuspidatum*	Yes	1, 2, 3, 4, 5, 6, 7, 8	87
sweet cherry	*Prunus avium*	Yes	4, 5, 6, 7, 8	not ranked
creeping buttercup	*Ranunculus repens*	Yes	1, 2, 3, 4, 5, 6, 7, 8	54
rugosa rose	*Rosa rugosa*	Yes	5, 6, 7, 8	not ranked
common sheep sorrel	*Rumex acetosella*	Yes	1, 4, 5, 6, 7, 8	51
curly dock	*Rumex crispus*	Yes	4, 8	48
bitter dock	*Rumex obtusifolius*	Unknown	1	48
birdseye pearlwort	*Sagina procumbens*	Yes	4, 8	not ranked
European mountain-ash	*Sorbus aucuparia*	Yes	2, 3, 4, 5, 6, 7, 8	59
common dandelion	*Taraxacum officinale* spp. *officinale*	Yes	1, 2, 3, 4, 5, 6, 7, 8	58
Red clover	*Trifolium pratense*	Yes	2, 4, 8	53
white clover	*Trifolium repens*	Yes	1, 3, 4, 5, 6, 7, 8	59
perennial sow thistle	*Sonchus arvensis*	No	4	73

(a) - 1 =2000 Exotic Plant Inventory, 2 = 2002 AKNHP Vascular Plant Survey; 3 = 2004 Exotic Plant Inventory; 4 = 2005 Exotic Plant Inventory; 5 = 2006 Exotic Plant Inventory; 6 = 2007 Exotic Plant Inventory; 7 = 2008 Exotic Plant Inventory, 8 = 2009 Exotic Plant Inventory

(b) – Ranking according to threat to native ecosystems in Alaska from low (0) to high (100)

http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm on 11/10/08

“Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.”
- Margaret Mead